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uncertainty arises in that the value 60.27 seems itself a little abnormal.

Referring to the equation found for this anemometer on this machine, we have,

$$v = 0.910 + 1.02729 c - 0.00076 c^2,$$

from which, when $c = 60.4$,

$$\frac{dv}{dc} = 0.935.$$

Using this co-efficient to reduce the contacts observed in the second case to those corresponding to the velocity 62.24 of the first case, we have 60.22 contacts as the number per hour. To be accurate, the observed *Mitwind* in the second case should also be reduced to the velocity of the first case. Preserving its proportionality to the arm-velocity, we find its value to be 4.67 kilometres per hour. Hence it seems we should have

v	c	x
62.24	60.04	4.91
62.24	60.22	4.67
Differences.....	0.18	0.24

Using the co-efficient 0.935 to reduce contacts per hour to kilometres per hour, we have corresponding to 0.18 contacts per hour a velocity of 0.17 kilometres per hour. Hence finally,

$$\frac{v_2 - v_1}{x_1 - x_2} = \frac{0.17}{0.24} = 0.71 = a.$$

The true *Mitwind*, according to this value, would be 5.2 per cent, — a value practically the same as that found by Dohrandt; namely, 5 per cent. Considering that the latter value applies to much larger anemometers than the former, the still outstanding difference is probably due to the point already noted, that in the recent experiments a Robinson anemometer, and not an air-meter, was used. Further light would no doubt be thrown upon the question of the value of the *Mitwind*, if experiments were made in which the stationary air-meter is replaced by a small and very sensitive Robinson anemometer.

It is hardly probable that the *Mitwind* is strictly tangential to the path of the whirled anemometer: indeed, the writer has observed a marked tendency to a spiral motion of the air and air-meters with their axes tangent to the circular paths of the end of the whirling arm, — get, as it were, only the tangential component.

These considerations, it would seem, throw more or less doubt upon the accuracy of the *Mitwind* corrections as obtained by both experimenters, though in each case the results agree very well among themselves. Unfortunately Mr. Dubinsky does not give the numerical relations between the 'contacts' and the revolutions of the cups, by which it becomes possible to make comparisons with anemometers of different construction in this respect.

C. F. MARVIN.

Washington, D.C., Nov. 12.

A Telescope for the New Astronomy.

As we become accustomed to celestial phenomena, we find a large number of faint appearances, upon the interpretation of which our knowledge of the forces at work depends: for instance, the detection of the carbon atmosphere surrounding the sun, foreshadowed by Archimis in 1875 by the detection of the bright carbon band in the blue in the spectrum of the zodiacal light, inferred by Lockyer in 1878 from a comparison of the solar and electric arc spectra, indicated also by the observations of Schuster at Sohag and by Abney in 1881, and finally worked out line by line by the large instruments and photographic methods of Rowland; or,

again, the faint bright lines detected in the spectrum of many stars, affording new ideas both as to the cause of the variability of the stars' light and the classification of stellar spectra as worked out from the study of meteorites by Lockyer. We find also that we are not dealing with constant things: change and change again are the only law. As the gravitational astronomer reaches his conclusions by following the changing positions of the heavenly bodies, so the physical astronomer must watch its ever-changing appearance. Recall to mind the discussion over the well-known comet spectrum, one astronomer averring from personal observation, deserving great respect, that the line belonged to the carbonic-oxide spectrum, while his rival assured us from equally trustworthy sources that it was nothing if not hydrocarbon. Science to-day tells us both were right, a slight change in the density of the gas being sufficient to change the spectrum from one to another. Our knowledge is therefore far from complete till we have substituted the series for the single observation.

But the human eye and the human brain are not sufficient — nay, are sometimes misleading — when complete and accurate detail are desired. Our attention is attracted by the points raised by the current theories of the day; and much is left unnoticed, or, if sought, is missed because one did not know where to look. The history of the discovery of the solar prominences, easily seen, after discovery, by the same observer, using the same telescope with which he had previously been unable to discover their existence, presents an example. Photography to-day supplies a remedy. In the hands of a master skilled both in the manipulation of the emulsion and the dye, its effect is not slight; its advantage, much the same as a balloon would give the voyager in the frozen seas, — showing at a bird's-eye glance what years of travel could not show. By it we may carry our best telescopes and our best seeing into every home and school-room; forming in his very youth the astronomer of the future, who shall work without telescope or observatory; rendering him familiar with those appearances which, not so many years ago, enchain'd his ancestors.

From its scientific side, of what great value has the chance delineation of the tails of comets been in the hands of Bredechin?

It is not every telescope which is fitted to this end. It must be pre-eminently a light-gatherer, which demands a large-sized object-glass, with the attendant mounting, and yet possess the ease and accuracy of motion of a sylph. It must be of great length, — thirty-five or forty feet, — and yet from end to end have no mass of metal which could produce an air-tremor. Yet such an instrument — the El Dorado of full many an astronomer — to-day grows in the workshop of an English astronomer.

Seven feet in diameter, and of great thickness, is the reflecting mirror; forty feet, its length from end to end. Yet tube it has practically none. Tons in weight, it follows the steady pressure of your little finger. Pedestal it has none, but floats upon its polar axis like a large warship; this polar axis being little else than a large boiler, so arranged, that, "should it be thrown into the sea in a given latitude, it would still point its axis to the pole."

With an instrument of less than a fifth its power, Common's well-known photograph of the nebula in Orion was taken. With one of less than a seventh of its capacity, the nebula in the Pleiades was discovered. The wonders reported from Mount Hamilton show us what we may expect it to disclose.

The instrument is secured to us through the *esprit* of a well-known astronomer. Is it not possible that among the readers of your journal may be found many who would contribute something towards its endowment? Of all our observatories, there is none that is popular. Can we not make the largest glass the world has yet seen popular?

S. O.

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